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ABSTRACT

This paper provides examples of intermediary organizations that assist school systems to integrate computer technology into their programs through the provision of financial and/or technical assistance. The organizations are classified into five major categories: (1) free-standing organizations; (2) the collaborative council (representing collaborative efforts among industry, education, and labor representatives); (3) colleges and universities; (4) professional associations; and (5) community-based organizations. The services of each of the intermediary organizations listed are described. In addition, the role of the business enterprise, though not strictly an "intermediary" as the term is used in the paper, is noted. (29 references) (GL)

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ROLE OF INTERMEDIARY ORGANIZATIONS

IN

COMPUTER EDUCATION AND TECHNOLOGICAL LITERACY

Paul E. Barton

National Institute for Work and Learning
For the National Institute of Education

1983

The views expressed in this paper
are solely those of the author.

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Introduction

While everyone knows that the computer will play a considerable role in public education, the debate continues as to what that role should be. Talked about widely, but with still less certainty as to its implication, is the more often expressed desire to improve "technological literacy". While approaches to both vary widely, and the majority of school children remain so far untouched by either, there is also uncertainty as to how such instruction is to be brought to the classroom, given the fact that school administrators and teachers have had even less exposure than their students (who are playing the computer games).

The common perception is of school systems making careful decisions about what role they want computers to play, followed by the purchase of hardware and software, or widely publicized donations of equipment from the companies that make them. A less known, but growing, development is the role of brokers who aid the schools and the teachers in the process of translating the existence of computers into actual classroom instruction, or bring other kinds of information about new technologies to the classroom. We have here called them intermediary organizations. They are intermediary between the new possibilities in education and the classroom. We do not know how many there are or how much they are involved in aiding the instruction that is now occurring in the classroom. We do know that there are a variety of them and their appearance may be a significant development. The schools need help; such organizations are providing it.

The schools, if they are soon to integrate computers into the education system, are going to need a lot of help, both financial and technical. The costs are staggering and the need for trained and retrained personnel enormous. In 1980 a study was carried out in California of "problems inhibiting development of computer-supported instruction in elementary and secondary schools." The results were as follows:1/

	Percent		
	Elementary	Secondary	Unified
Lack of financial resources	46.5	48.8	49.1
Inadequately prepared faculty	30.2	26.2	25.7
Lack of program director	14.0	14.3	13.2
Lack of space	5.8	3.6	5.4
Other	3.5	7.1	6.6

If these are generally the barriers, it is easy to see that intermediary organizations can be of assistance.

However, a greater problem that, from an educational perspective, is not so tractable is deciding on what computer literacy means, and what role computers should play in education. This is by no means settled. There are a number of educational questions, such as whether instruction should be in how to use computers and programming or whether computers should be used principally as tools in subject matter teaching, whether they should be used chiefly for drill and practice or whether

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1/ Carl Stutzman, summarized in High Technology and High School, Office of Appropriate Technology, State of California, 1982, p.112.

"computer assisted instruction" or "computer managed instruction" is a preferred use, and whether pervasive change...hard to achieve...is necessary if computers are to be used for desired educational purposes. William Raspberry even wrote recently: "Except for the math-and-engineering minded, it's probably a mistake to push our youngsters too hard into computers."2/ Intermediary organizations can assist the schools, but they cannot be expected to set educational objectives...a duty of the school system that cannot be transferred or delegated.

These "intermediary" organizations are all outside the schools, helping the schools in one way or another. Since computer manufacturers who donate equipment and other services are working directly with the schools, they are not included here as intermediary organizations (except for a general discussion of business involvement). What is reported here is only a beginning in identifying such organizations and the role they play. No comprehensive survey was conducted, so we do not know how complete this reporting is. It does establish the different kinds of organizations and provides examples of them. It does not say anything about their effectiveness or the correctness of the assumptions underlying their approach, for they were not visited by the author, and no evaluations of them were identified in the course of preparing this paper.

2/ William Raspberry, "Do We Really Have to Study Computers?", Washington Post, October 3rd, 1983.

FREE STANDING INTERMEDIARIES

Each of the efforts below is unique in one way or another and represents a diversity of approaches to helping the schools or, in one case, delivering services directly to out-of-school youth.

The Chicago Computer Literacy Task Force was formed in 1982 as a cooperative venture of business and labor leaders, parents, educators, community leaders, and public officials dedicated to achieving computer literacy among all segments of the adult and youth population in the Chicago area. Its goals are broad: "To act as the citizen's voice in establishing computer learning opportunities for every student in every public and private elementary and secondary school, and in community educational institutions, ... by the end of the school year 1985-1986."3/ Since the task force is new, many of its activities are still in the development and funding stage.

In 1973 the state legislature created the Minnesota Educational Computer Consortium (MECC). Instructional use of computers had begun on an experimental basis in the 1960s, and as their use grew, the legislature decided to create a single agency to serve the 433 public school districts and 30 public colleges. Now, more than 95 percent of Minnesota school districts and colleges are using the computer in instruction. MECC provides computer services where it is more economical to share them

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3/ For more information, the address of the task force is One North Lasalle, 2148, Chicago, Illinois 60602.

across the system. It offers access to a large central computer, software, technical assistance, and in-service training.

Through the MECC Timeshare System, a Control Data computer is available to 400 users simultaneously. There is a network of 1,200 timeshare terminals, more than 300 point-to-point telephone lines, and 300 dial-in lines. This system reaches every public college and 60 percent of the school districts.4/

Educational Products Information Exchange (EPIE), founded in 1967, is a consumer minded nonprofit organization in New York City. Its goal, according to Jacqueline Hunt, "is to see that computers in the classroom do not meet [illegible] oversold and underused fate as language labs, overhead projectors, or instructional television." Educators receive EPIE evaluations of hardware, software, printers, and manuals to keep teachers informed consumers.5/

EPIE has a full- and part-time staff of about 25, supplemented by more than 25 free-lance product evaluators around the Nation. Its 1983 budget is $700,000, including revenues from grants as well as $400,000 in fees collected for product

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4/ Don G. Rawitch, Voc Ed., April 1982. For further information write the MECC Manager of User Services, 2520 Broadway Drive, St. Paul, MN 55113.

5/ Jacqueline M. Hunt, State-of-the-Art Report on Computer Based Learning Games, National Institute for Work and Learning, 1983.

evaluations and subscriptions to its newsletter. EPIE has joined forces with Consumers Union; the combined effort has received a two-year grant from the Ford Foundation of $300,000. Already a well known source of evaluations and guidance, the goal of P. Kenneth Komoski, executive director of EPIE, is to "eventually be able to convince one-fourth of the nation's yearly 16,000 school districts to subscribe to the service."6/

The New Jersey Business/Industry/Science Education Consortium has the improvement of science teaching as its major objective but is also concerned with improving scientific and technological literacy. For example, in 1982 it sponsored a one day teacher workshop at Stevens Institute on [illegible] acceptance of technology. Instruction was provided in computer graphics to illustrate the issues discussed. While the consortium plans more workshops and symposia, it is interested in teaching other organizations to do what it is doing and is willing to devote time to it.7/

Newly established in 1983, the Network for Action in Microcomputer Education (NAME) is "a grass roots consortium of school districts ...", located in Wayne, New Jersey. It is supported by

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6/ Charles Euchner, "Kenneth Komoski Helps Wary 'Consumers' by Evaluating Computer Products for Schools," "Education Week, February 2, 1983, p.7.

7/ Dr. Philip Mackey, "Improving New Jersey's Science Education", School Leader, January/February, 1983, p. 31. For more information contact Dean Joseph Moeller, Stevens Institute, (201) 420-5229.

membership fees of $500 per district. The three main areas in the initial period of operations are:

1. In-service education to develop skills in microcomputer use.
2. Collective purchasing plans and license agreements to save money, simplify procedures, and maximize the influence of the group with vendors and manufacturers.
3. Sharing of information and other resources which enhance effectiveness while avoiding duplication of efforts.8/

Tennessee has a state-wide Microcomputer Advisory Committee that will work with the State Department of Education to achieve the stated goal that "All children in Tennessee public schools will learn basic computer skills before entering high school." The estimate is that 4,435 microcomputers will be needed to achieve this goal.9/

The National Association for the Exchange of Industrial Resources (NAEIR) is a nonprofit organization located near Chicago that serves as an intermediary between those who donate equipment and those who need it. It has 1,200 members who pay fees of $250 per year. In 1982 the member institutions received

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8/ From correspondence with Henry J. Petersen. For additional information contact Mr. Petersen at Fallon Educational Center, 51 Clifford Drive, Wayne, New Jersey 07470. (201) 694-8600.

9/ The Bulletin of NAVA, The International Communications Industries Association, p.2.

$10 million worth of equipment. The materials range from hacksaw blades to computers. The average value each member receives is $3,000 per year.10/

One example of an effort that is reaching those most likely to be left behind in computer literacy is PLAYING TO WIN INC. In the summer of 1983, it opened the East Harlem Computer Use and Resource Center. The Center will promote the educational use of computers among low-income, minority, incarcerated, and ex-offender populations. The Center was opened with six Atari 800 computers offering a wide range of educational computing for over 350 individuals weekly.11/

THE COLLABORATIVE COUNCIL

Over the last ten years there has been the establishment and growth of collaborative efforts among industry, education, and labor representatives to join together in efforts to smooth the transition from school to work and provide assistance to the educational enterprise. There are about 150 such councils now in existence and they could become a key intermediary in helping the schools with computer based instruction and technological literacy in general. The names of these councils vary, with many called Education-Work Councils and Industry-Education Councils.

10/ Jim Benclvenga, Christian Science Monitor, December 10, 1982. More information can be obtained from NAEIR at 550 Frontage Road, Northfield, IL 60093.

11/ For more information call Playing To Win, (212) 650-0229.

The principal advocates of such councils are the National Institute for Work and Learning and the National Association of Industry-Education Councils.

There has been no survey of the extent to which such councils have already been engaged in such activities, but two examples are provided.

California has a state-wide network of collaborative councils, headed by the Industry Education Council of California. In response to the concern of California companies, the Council has established a task force to deal with problems in the math/science/computer fields. The Council is identifying outstanding school programs and trying to transport them to other parts of the State. Educator workshops are being established to keep teachers and counselors informed of changing technologies. Computer literacy workshops are being offered to school districts, and teacher centers are being organized to promote computer literacy. In exchange for industry input and equipment loans, schools will revise curricula to more nearly meet employer needs. Outstanding math/science/computer programs will be recognized by industry. The State-wide effort is being diffused locally through several of the 27 local councils that make up the California network.12/

12/ Press release of the Industry Education Council of California dated October 21, 1982. More information can be obtained from Jan Half, 1575 Old Bayshore Highway, Burlingame, CA 94010. (415) 697-4311.

Another quite different program grows out of a joint effort of the National Institute for Work and Learning (NIWL) and the Trident Work-Education Council in Charleston, South Carolina. NIWL conceived of Project TECPLAY, in which computer games would be combined with computer learning games to attract inner city school dropouts. The project also provides career planning. It has involved the community's employers in the development of the center as well as the community's social services and neighborhood leadership to sustain participation.

The effort in Charleston has a broad base of community involvement which includes the Charleston Higher Education Consortium (as overall manager), Trident Technical College (operator of the neighborhood Fair Break Center where the project is housed), and the City of Charleston (through a separate economic development project contracted with Control Data Corporation and City Venture Corporation).

All of the learning games and programs are from Control Data's Plato program. Eight micro-terminals are used for basic skills such as reading and math, with some employability skills software. Two on-line terminals are used for student assessment. Computer-based tests are used to find out where students are and to prescribe learning objectives. Pure computer games are used both to stimulate interest and as rewards for the performance of other tasks.13/

13/ For more information, contact the Project Director, Gerard Gold, National Institute for Work and Learning, Suite 501, 1302 18th Street, NW, Washington, DC 20036. (202) 887-6800.

While the project is currently dealing with school dropouts, there are plans to extend it to in-school students.

COLLEGES AND UNIVERSITIES

There is a growing trend in the involvement of colleges and universities in elementary and secondary computer based learning and computer literacy. They are of considerable variety, ranging from direct offerings at the campus to in-service instruction of teachers to outreach services direct to the schools. The motivations are diverse. One seems to be entrepreneurial, as schools fight for new ways to bolster income as college student enrollment declines. Others see a responsibility to public education because they have schools of education and produce the teachers. Others may well see recruitment after high school graduation as at least a desirable side effect.

One approach that is reported to be booming is the summer camp for school children in which hands-on computer experience is offered. This is a very recent development, with the first summer camp established in 1981. According to Thomas Copley, head of the Yellow Springs Computer Camp at Antioch College in Ohio, there were from 75 to 100 such camps in 1982 with an estimate that 250 camps were in operation the summer of 1983. Copley reports that the residential camps run from one to two weeks and cost around $350 a week.

Although most camps emphasize programming skills, some go beyond. The Hollins College computer camp in Roanoke, Virginia

seeks to give students a broader view of computer technology. With the under-representation of females in the computer field in mind, Hood College in Frederick, Maryland opened the first computer camp exclusively for females. Copley expects more competition for the colleges as more private computer companies establish their own camps.14/

During the summer of 1983, the University of Delaware operated an experimental summer camp for preschoolers, financed by the university's College of Human Services and the Office of Computer-Based Instruction. A variety of means were used, including: a maze students learned to walk blindfolded as a means of teaching how a computer operates; a giant keyboard display on which the children hopscotched, spelling their names or picking out numbers; and the computerizing of toy cars to perform as they wanted them to. After such preliminaries the students worked at computer terminals. The co-director of the camp explained that the objective was the development of a computer vocabulary and an understanding of logical thinking. It was found that the preschoolers readily adapted to the computer and had a strong interest in it. The University of Maryland also runs a camp for preschoolers.15/

14/ These summer camp developments were reported on at the 1983 meeting of the American Association for Higher Education. The information presented here is from Manpower and Vocational Education Weekly, April 7, 1983.

15/ The Chronicle of Higher Education, August 3, 1983, p. 12.

Ohio State University, the Columbus school district, and local businesses collaborated the summer of 1983 in a project to bring 10,000 people into contact with computers, called Summer Tech '83. All ages were involved at a cost of only $20. OSU designed the 10-hour curriculum and trained instructors. Local businesses donated $375,000 worth of equipment. After the summer program, the computers were distributed among the district's 16 high schools to be used by the students by day and adults at night.16/

Bank Street College of Education in New York City has a weekend course for teachers called Computers in Education. The program prepares experienced teachers and school administrators to design and implement computer education programs in elementary and junior high schools. The program relates educational applications of computers to stages of child development, theories of learning, and philosophical issues raised by new technology.17/

Bank Street also has a Computer Outreach Service for schools. The goal of the service is to help educators integrate computers into their overall educational program, "using the new technology to enhance the learning environment rather than as an

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16/ Education and Work, August 9, 1983, p. 8.

17/ For more information contact Barbara Dubitsky, Bank Street College of Education, 610 West 112th Street, New York, New York 10025.

end in itself". Four types of services are offered:

1. Comprehensive staff development projects.
2. On-site workshops and courses on specific topics in microcomputer education.
3. Consultation services for the planning and development of computer education projects at the school, district, or regional levels.
4. Assistance with staff supervision and program evaluation.[18]

ASSOCIATIONS

Professional associations are usually alert to the emerging needs of their members, and the role of the computer in learning and technological literacy are increasingly important to the members of [illegible]ations involving school personnel. These associations are in a position to help their membership considerably, in their publications, National and regional meetings, and *ad hoc* workshops.

While no attempt has been made to survey what these associations now do, a few examples will be provided. There is one association devoted wholly to the matter, the Association for Educational Communications and Technology, in existence for 60 years, starting with the implications of film for education in the 1920s. AECT has 14,000 members. According to its brochure "AECT advances the interests of both its members and communications technology, promotes the integral role of instructional technology in the educational process and monitors

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[18] For further information contact Steve Shuller, Bank Street College of Education, 610 West 112th Street, New York, New York 10025.

government policies that affect instructional technology." AECT operates through 48 state-wide and national affiliates.

Presently, AECT is running Project BEST (Basic Education Skills through Technology), funded by the Department of Education. Its purpose is to strengthen the capacity of state departments of education to work with their local schools in planning for the use of modern information technology in basic skills instruction. Project BEST is sharing knowledge about the use of the microcomputer, satellite teleconferencing, electronic mail and the videodisc. The dissemination network includes 43 state sites and 19 national organizations that are collaborating with Project BEST.19/

The National Education Association (NEA) operates the NEA Computer Service. At present the principal product of the service is a catalog which lists courseware that has been approved or disapproved by NEA. Future plans include establishing, on a regional basis, teams of experts to design teacher training seminars.20/

In the spring of 1983 the American Vocational Association ran eight regional workshops on high technology for teachers, administrators, and planners. Area industry leaders presented their views on high-tech developments, and educators described

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19/ For further information contact Association for Educational Communications Technology, 1126 Sixteenth Street, NW, 20036. (202) 466-4780.

20/ Hunt, Op. Cit.

successful high-tech programs. The workshops were carried out in cooperation with the National Association of State Directors of Vocational Education.21/ Speaking at a workshop, Gene Bottoms, Executive Director of the AVA, said that "The computer will become essential for most vocational students."22/

According to the study by Jacqueline Hunt, as of mid-1983 about 30 organizations had been created to assist teachers and administrators, and most of them are associations funded from members' dues. Among others, she cites Microcomputer Software Information for Teachers (MicroSIFT), Computer-Using Educators (CUE), The National Council of Teachers of Mathematics, and Conduit.23/

These associations spring up in one place, and they reach out and grow. For example, CUE was established by educators in Santa Clara Valley. It was reported to have 700 members by mid-1981, in 29 states. The founder of the group has been hired full-time by the county office of education to help schools establish computer programs.24/

From this brief review, it can be seen that there are rapid developments on the association front, and that such associations

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21/ AVA Update, June 1983.

22/ Voc Ed, May 1983.

23/ Hunt, Op. Cit.

24/ Education and High Technology Industry: The Case of Silicon Valley, Elizabeth Useem, August 1981.

can likely become important brokers in helping teachers and schools in the computer age.

COMMUNITY BASED ORGANIZATIONS

During the 1970s there was an important development in youth education and training. It was the creation of a variety of what have come to be called Community Based Organizations, or CBOs for short. While they are not an intermediary in the sense of being brokers that assist the public school, they represent an alternative mode of delivery of computer learning and computer and technological literacy to youth. They also are working with the youth who are most disadvantaged and members of minority groups, the very groups most likely to be left out of such instruction in the regular school system.

These CBOs are variously funded, although they relied on government money when it was available through the Comprehensive Employment and Training Act. When those funds were drastically reduced in the replacement legislation, they turned more to the private and foundation sectors for support. Most of them are still operating, but with much reduced funding. Their survival and growth will mean a lot to those who opt out of the public school system, or leave it as graduates ill equipped for the employment world. Two examples will be provided, although most of them have entered the computer learning field.

OICs of America has been in continuous operation for 18 years. It has created the Learning Opportunities Centers Program

(LOC), operating in Milwaukee, Wisconsin, Providence, Rhode Island, and Seattle, Washington. Since the population served by LOC has high unemployment rates, the LOCs will offer training in basic education skills, plus vocational and pre-employment skills. OIC computer-based education has two components: computer assisted instruction (CAI) and computer managed instruction (CMI).

Through CAI computers deliver individualized, competency-based instruction. For slower students, computers monitor progress and offer diagnostic/prescriptive techniques. For accelerated students, computers are used for enrichment and self-teaching. CMI is used to assist the classroom teacher in maintaining individual students' course records, scoring tests, and prescribing instruction related to test performance.

The OIC program is based on a "developmental intervention strategy". A sequential series of programs is designed to help youth acquire increasingly advanced competencies. A typical program develops competencies in:

- Pre-employment/work maturity skills
- Basic education skills in reading, math, and preparation for a General Education Development (GED) diploma, where appropriate.
- Vocationally oriented skills which are industry sanctioned.

Open entry/open exit format allows new students to continually enter the program and progress at their own speed.

Control Data Corporation has donated Viking 110 computer terminals to each site. The Seattle LOC will utilize a cluster system consisting of a classroom of between 10 and 100 terminals connected to a microcomputer. Milwaukee and Rhode Island LOCs will utilize terminals from the Computer Curriculum Corporation connected to a microcomputer located in an area high school.25/

While cutbacks in Federal funding have caused serious problems for CBO programs, one program has been operating 13 years entirely with private funding. The Urban League Computer Training Center is located in the heart of the Watts district in Los Angeles. It started as a three-way partnership by Bank of America, IBM, and the Los Angeles Urban League. Addi[illegible] corporate partners have been added since then.

Since it opened, more than 1,800 have completed training and about 1,600 have been placed in jobs. The program's 31 member employer advisory board hires over 50 percent of the graduates. This L.A. center has served as the prototype for 6 other centers, three operated by the Urban League and three by OICs. High standards are required of students, emphasizing high motivation, professional dress and behavior, high achievement during training, punctuality, and regular attendance. The program offers business programming, computer operations and programming,

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25/ For more information contact Benjamin Lattimore, OICs of America, Inc., 100 West Coulter Street, Philadelphia, PA 19144. (215) V19-3010.

advanced computer operations, and office procedures and word processing.26/

BUSINESS INVOLVEMENT

While the business enterprise working to increase computer availability and use in public education is not strictly an "intermediary" as the term is used in this paper, it is an agent outside the schools and very important in shaping and reshaping the education system. Business involvement is along many different lines, although information is not available for expressing this involvement in quantitative terms. It may be useful to identify and illustrate the many types of involvement and motivations behind it. While there are some particular interests at play on the part of computer hardware and software manufacturers in the computer aspects of education, the business interest and participation in computer education will parallel its interests in quality education generally. After an intensive review of corporate interest in public education, Michael Timpane concluded:

> Greater understanding of the corporate interest seems a necessary precondition to more effective, sustained activity to enhance corporate efforts. The motives ascribed to corporate involvement range from the noblest impulse to strengthen the democratic free

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26/ From You and Youth, January/February 1982. More information can be obtained from Sandra Carter, 7226 South Figueroa, Los Angeles, CA 90003.

enterprise system to the narrowly self-interested desire to gain public relations advantages. In every actual case, of course, the motivations are incredibly complex. Corporate interests in education are extremely diverse and not always compatible: recruitment and retraining of a skilled workforce; maintaining a stable community base for business activity; retaining valued employees; obtaining community good-will and gratitude; keeping school-related taxation at reasonable levels; promoting inquiry and research of possible benefit to the corporation; and so forth.27/

Complexity and mixed motivations also characterize the corporate interest in computer education.

- School Boards

  The oldest kind of involvement of business people in education generally and in any new and important issue of computer and technological education is through participation on school boards. Serving on school boards, even dominating them, was prevalent until recent times, when the various protests and revolutions of the past two decades dulled business enthusiasm for such participation. Strong business participation at this policy making level might be the most constructive role

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27/ Michael Timpane, Corporations and Public Education in the Cities, Teachers College, Columbia University, May 1982.

business people could play in education generally, and in integrating computers and technology into the curriculum of the school system. A representative of the U.S. Chamber of Commerce recently called for business to return to the school board:

> Twenty years ago, school boards were populated by business people who were community leaders. Today, for many reasons, representatives of teacher unions and other interest groups dominate school boards. Responsible business people must return to the school boards to craft appropriate policies....28/

- Collaborative Networks

Another business role that is broad in its involvement in education is participation in local "collaborative councils", described earlier in this paper. These councils bring the critical sectors of the community together to focus on education issues and smoothing the transition from school to work. The TECPLAY project in Charleston and the task force on math/science/computer fields established by the Industry Education Council of California are examples of efforts of these councils in the specific area of computers. The potential business involvement is considerable through this form of participation: California alone has 27 local councils.

28/ Madeleine B. Hemmings, "American Education: An Economic Issue", HR & EB Regulation Status Report, Chamber of Commerce of the United States, 1982.

- Concern Over Youth and Minority Unemployment

  Since the 1960s much of the involvement of business in helping youth has been fueled by the high unemployment experienced by disadvantaged and minority youth. Since computer related occupations represent growing opportunities for employment, providing equipment and financial resources to aid youth training in these fields has made sense for a considerable number of computer manufacturers, and other kinds of corporations as well. Control Data has been heavily involved. IBM and Bank of America were leaders in starting the Urban League Computer Training Center in Los Angeles. IBM has been starting new such centers every year.

- Direct Skill Needs

  The high technology firms may aid public school computer education because of immediate or perceived long-term skill needs. Raytheon, for example, was concerned about the high turnover rate among its computer scientists. The conclusion was that high turnover was partly related to the fact that the highly trained individual disliked some of the routine work. Through a combined teacher training, internship, curriculum design, and equipment donation approach, high school students are learning a variety of computer skills. Raytheon found that by

using these graduates as assistants to computer scientists, turnover could be significantly cut. 29/

- Future Markets

  The sale of future computer and high tech products is recognized to depend on familiarity with them. One motivation for aiding public education in this area is the need to create future markets. A more immediate and direct motivation is to gain product familiarity by donating equipment for school use. Such donations, while of great value to the schools, may not be as costly to industry as price tags suggest, in situations where a new generation of products depreciates the value of old ones (although an outlet for less-than-state-of-the-art equipment is not advanced here as a principal reason for equipment donations).

- In Service to the Public

  There is no reason to believe that aid to public education in this area is always for an immediate and specific corporate benefit. Corporate philanthropy in education has been considerable at the higher education level. It is really only beginning at the level of elementary and secondary education. For high tech firms,

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29/ Interview with Bo White, Raytheon Training Director, 1982. For a detailed description, see Henrietta Schilit and Richard Lacey, The Private Sector Youth Connection, Vocational Foundation, 1982, pp.32-34.

it is natural that their giving to the schools often takes the form of donations and time in the product areas in which they specialize.

This classification of various forms of aid, and reasons for giving, is not meant to suggest that such aid is in anyway pervasive, although it is considerable among the very large computer firms. In fact, there may be quite limited relationships between high tech firms and their own local school systems, as was discovered in the case studies of Route 128 and Silicon Valley carried out by Elizabeth Useem. Whatever its magnitude, aid to the schools in the computer area is greater than in science and math instruction. I would speculate that this is true because computers are a tangible product of corporations, and their donation and instruction in their use are much easier than interventions to improve the quality of science and math education.

CONCLUSIONS

Not too much should be concluded based on this exploratory survey. It is clear that the involvement of such organizations is already reaching significant levels, and this fact alone suggests that they be considered a potentially important element in the unfolding saga of the impact of computers on education.

There are a number of examples of local collaborative councils and other community based efforts with broad community

representation that, on the face of it, seem to bring the whole community to bear on the problem. This kind of assistance would seem to be entirely positive and represents an encouraging broadening out of the responsibility for education. Fueled by the drama of computers, these collaborations may be encouraged to help on other important educational matters. Of course, it may be entirely possible that communities will jump on the wrong bandwagon, in which case the schools may be led into approaches and objectives they would not (or should not) choose.

The various associations can be expected to serve their members on those fronts where the members need the most help. The need for help on the computer front is likely to remain strong, and we can expect to see considerable association activity.

Whether it is the help provided by these intermediaries or the help provided by the manufacturers of the equipment, there is one worrisome possibility: that how schools approach this vital matter of education will be heavily influenced by what these helping organizations are offering. The choices before the schools are difficult, and not always simple. They should not settle for computer use only for drill and practice just because that is the kind of in-service training that is available to them.

This raises the important question of how much these intermediaries should play a role in shaping educational policy and how much they should hold to helping the schools carry out the policies freely made by the educators in charge.

There are some obvious implications for regarding the real possibility that those who have the most will get the most by way of computer and other technological skills, with a gap widening between the haves and the have nots. Several of the examples here provided, such as Playing to Win, TECPLAY, and the CBOs are examples of counter-efforts -- they are reaching those most educationally disadvantaged.

While there may be risks as well as advantages, it is encouraging to see that a variety of helping mechanisms are being developed. Done with a proper respect for the proposition that it is the responsibility of educators to make wise decisions about proper directions in computer and technological education, these developments are to be encouraged. It might be helpful to identify a number of intermediaries and prepare more detailed descriptions, or case studies, to be disseminated to encourage the spread of good practice.